

What is claimed is:

1. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its sodium salt as major components, wherein:

(1) the aqueous solution has a monomer component concentration of not less than 45 weight %;

(2) the polymerization is carried out while water is evaporated so that the ratio (concentration ratio) between a solid component concentration in a hydropolymer as formed by the polymerization and a solid component concentration in the aqueous monomer solution will not be less than 1.10; and

(3) the solid component concentration in the hydropolymer as formed by the polymerization is not more than 80 weight %.

2. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components, wherein:

(1) the highest temperature during the polymerization is not lower than 100 °C;

(2) the polymerization initiation temperature is not lower than 50 °C; and

(3) acrylic acid and/or water which evaporate during the polymerization are collected and recycled.

3. A process for producing a water-absorbent resin, which

comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components, wherein:

(1) the polymerization initiation temperature is not lower than 50 °C;

(2) the solid component concentration in a hydropolymer as formed by the polymerization is not more than 80 weight %; and

(3) the polymerization time is shorter than 3 minutes.

4. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components, wherein:

(1) at least one photoinitiator and at least one thermal initiator are used together as polymerization initiators; and

(2) the highest temperature during the polymerization is not lower than 105 °C.

5. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components, wherein:

(1) at least one photoinitiator and at least one thermal initiator are used together as polymerization initiators;

(2) the polymerization initiation temperature is not lower than 50 °C; and

(3) the aqueous solution has a monomer component concentration of not less than 45 weight %.

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6. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its sodium salt as major components, wherein:

- (1) the neutralization ratio of acrylic acid is not less than 50 mol %;
- (2) the polymerization initiation temperature is not lower than 50 °C;
- (3) the solid component concentration in a hydropolymer as formed by the polymerization is not more than 80 weight %; and
- (4) the polymerization time is shorter than 3 minutes.

7. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components, wherein:

- (1) the polymerization initiation temperature is not lower than 50 °C;
- (2) the aqueous solution has a monomer component concentration of not less than 45 weight %; and
- (3) the polymerization temperature-rising ratio is not more than 0.30.

8. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its sodium salt as major components, wherein:

- (1) the polymerization initiation temperature is not lower than

50 °C;

(2) the aqueous solution has a monomer component concentration of not less than 45 weight %; and

(3) the highest temperature during the polymerization is not higher than 140 °C.

9. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its sodium salt as major components, wherein:

(1) the aqueous solution has a monomer component concentration of not less than 45 weight %;

(2) the neutralization ratio of acrylic acid is not less than 50 mol %;

(3) the polymerization initiation temperature is not lower than 50 °C; and

(4) the difference between the polymerization initiation temperature and the highest temperature during the polymerization is not more than 70 °C.

10. A process according to claim 1, wherein the polymerization is initiated after raising the temperature of the aqueous solution by utilizing the heat of neutralization and/or the heat of dissolution of the acrylic acid and the alkali.

11. A process according to claim 1, wherein the neutralization ratio increases by not less than 2 points during the polymerization.

12. A process according to claim 1, wherein the neutralization ratio

of acrylic acid is in the range of 50 to 80 mol %, but not including 80 mol %.

13. A process according to claim 1, wherein the polymerization is carried out under atmospheric pressure.

14. A process according to claim 1, wherein the expansion magnification during the polymerization is not less than 2 times.

15. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components, wherein the polymerization proceeds under extension force.

16. A process according to claim 15, wherein the expansion magnification during the polymerization is not less than 2 times.

17. A process according to claim 15, wherein the extension force is brought about by boiling of water due to the heat of polymerization.

18. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components,

wherein the process further comprises the step of disintegrating a hydropolymer into particles of which the weight-average diameter is not larger than 100 mm wherein the hydropolymer is formed by the

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polymerization and has a solid component concentration in the range of 55 to 82 weight %.

19. A process according to claim 18, wherein the hydropolymer is disintegrated into particles of which the weight-average diameter is not larger than 10 mm.

20. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components,

wherein the process further comprises the step of disintegrating a hydropolymer with a disintegrating machine having a screen wherein the hydropolymer is formed by the polymerization and has a solid component concentration in the range of 55 to 82 weight %.

21. A process according to claim 20, wherein the disintegrating machine is a shearing type coarsely pulverizing machine or a cutting and/or shearing mill.

22. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components,

wherein the process further comprises the step of disintegrating a hydropolymer with a disintegrating machine so that the ratio of the increase of the solid component concentration during the disintegration may not be less than 2 points wherein the hydropolymer is formed by the

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polymerization and has a solid component concentration in the range of 55 to 82 weight %.

23. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components,

wherein the process further comprises the step of disintegrating a hydropolymer with a disintegrating machine while passing a gas through the disintegrating machine wherein the hydropolymer is formed by the polymerization and has a solid component concentration in the range of 55 to 82 weight %.

24. A process according to claim 18, which further comprises the step of drying the disintegrated hydropolymer.

25. A process according to claim 18, which further comprises the step of surface-crosslinking the disintegrated hydropolymer.

26. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components,

wherein the process further comprises the step of surface-crosslinking a particulate hydropolymer which is obtained by disintegrating a hydropolymer resultant from the polymerization and has a solid component concentration in the range of 55 to 82 weight %, a residual monomer content of not more than 1,000 ppm, and a

weight-average particle diameter of not larger than 3 mm.

27. A process for producing a water-absorbent resin, which comprises the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components, wherein:

(1) the polymerization step produces a hydropolymer having a solid component concentration in the range of 55 to 82 weight %;

and wherein the process further comprises the following steps:

(2) a disintegration step for disintegrating the hydropolymer, which has a solid component concentration in the range of 55 to 82 weight %, into particles of which the weight-average diameter is not larger than 10 mm; and

(3) a drying step for increasing the solid component concentration in the disintegrated hydropolymer by not less than 3 %.

28. A water-absorbent resin, which is obtained by a process including the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components, and has the following properties:

(1)  $20 \text{ (g/g)} \leq \text{absorption capacity without load (GV)} \leq 60 \text{ (g/g)}$ ;

(2)  $\text{absorption capacity under a load (AAP)} \geq 20 \text{ (g/g)}$ ; and

(3)  $\text{absorption capacity without load (GV)} \times \text{solubilization residue ratio (\%)} \leq 1,200 \text{ ((g/g)\%)}$ .

29. A water-absorbent resin according to claim 28, which is obtained by a process including the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic



acid and/or its salt as major components, wherein:

(1) the aqueous solution has a monomer component concentration of not less than 50 weight %; and

(2) an internal-crosslinking agent is used in a ratio of not larger than 0.02 mol % to the entirety of the water-absorbent resin-forming monomers;

and wherein the process further includes the steps of:

(3) surface-crosslinking the water-absorbent resin; and

(4) adding a chelating agent to the water-absorbent resin in a ratio of not less than 10 ppm thereto.

30. A disintegrated hydropolymer, which is obtained when producing a water-absorbent resin by a process including the step of polymerizing an aqueous solution of water-absorbent resin-forming monomers including acrylic acid and/or its salt as major components, and has a solid component concentration in the range of 55 to 82 weight %, a residual monomer content of not more than 1,000 ppm, and a weight-average particle diameter of not larger than 3 mm.

31. A hydropolymer according to claim 30, which is a surface-crosslinked one.

32. A sanitary article, which comprises the water-absorbent resin obtained by the process as recited in claim 1.

33. A sanitary article according to claim 32, which is a disposable diaper.

34. A sanitary article, which comprises the water-absorbent resin as recited in claim 28.

35. A sanitary article according to claim 34, which is a disposable diaper.

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